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MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY

ALBERT FREDERICK HILL

STUART KIMBALL HARRIS

Associate Editors

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THE NEW ENGLAND BOTANICAL CLUB

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THE GENUS LIATRIS

L. O. GAISER

THE North American genus *Liatris* has been considered one of unusual difficulty. Variability in and intergradations between the species are undoubtedly responsible for the bewildering problems in specific determination. When comparisons of various collections, used for the growing of cytological material, were made with herbarium specimens difficulties arose in the determination of species, and the project grew further into an examination of types and a taxonomic revision. It has seemed that the present summation of results might meet some others' needs as well as my own.

Preliminary work was begun in 1928 by the study of living cultures grown in a garden at Crediton, Ontario, from plants collected by the generous help of many botanists of the United States. Recognition of the great kindness of all those who contributed to that phase of the work will be made elsewhere. Many species have also been collected in the field on a trip in the south-central States, westward through Arkansas and southward through Texas to the Gulf of Mexico. The present treatment is, however, largely the result of an examination of the mass of material at the Gray Herbarium, where work was begun in the summer of 1938, at the New York Botanical Garden, where many types of Small and Rydberg are available, and the National Herbarium, Washington, which possesses a great number of specimens collected by E. S. Steele. Other herbaria have also been visited and particular collections, such as the Greene types

at Notre Dame University, the Nuttall and Pursh specimens at the Philadelphia Academy of Sciences, and the Gates specimens at the Brooklyn Botanical Garden, have been studied. As well, loans from other herbaria, as of Lunell's varieties of *L. scariosa* from the University of Minnesota and the University of Indiana have been of invaluable help. Representative collections received, as from the University of Oklahoma, the A. & M. College of Texas, the University of North Carolina, the National Museum of Canada, and the Fowler Collection from Queen's University, Kingston, have also been greatly appreciated. To all the curators of these and to the owners of private herbaria who have been such a help in making available to me so many specimens for study and comparison, I am greatly indebted and wish to express sincere gratitude. To Prof. I. M. Johnston, I gratefully acknowledge the stimulation and encouragement which involved me in undertaking this taxonomic study. I was immeasurably helped by having Prof. M. L. Fernald show me the photographs of type specimens in the herbarium of the Linnaean Society, London. To Mr. C. A. Weatherby, I am especially indebted for having obtained for me during his visit abroad to the herbaria and museums in London, Paris, and Geneva during the summer of 1939, photographs of many other type specimens, without which this study could not have progressed. From all the staff at the Gray Herbarium has come much appreciated help in occasional conferences which I am happy to acknowledge, as I am also appreciative of the ever generous help of the librarian, Miss R. D. Sanderson. To students who have done what must have been exacting typing for them, goes my most sincere gratitude for their help in the preparation of this manuscript.

In citing specimens from various herbaria the following abbreviations will be used:

G—Gray Herbarium, Harvard University; NY—New York Botanical Garden; US—National Herbarium, Washington; P—Academy of Natural Sciences, Philadelphia; B—Brooklyn Botanical Garden; ND—Greene Herbarium, Notre Dame University; M—University of Minnesota, Minneapolis; I—Indiana University, Indianapolis; T—College of A. & M., College Station, Texas; O—University of Oklahoma, Norman; NC—University of North Carolina, Chapel Hill; Ot—National Museum, Ottawa; Q—Queens University, Kingston, Ontario; To—University of Toronto, Ontario; W—University of Wisconsin, Madison; N—University

of Nebraska, Lincoln; OA—Herbarium of Prof. O. Ames, Ormond, Florida; HB—Herbarium of Mr. Hubert B. Brown, Toronto; WH—Herbarium of Mr. W. H. Herriot, owned by Mr. Monroe Landon, Simcoe, Ontario; F—University of Florida, Gainesville.

GENERAL DISCUSSION

BIBLIOGRAPHY OF THE GENUS AND ITS CHIEF SUBDIVISIONS

LIATRIS Schreb. Gen. Plant. ii. no. 1263, 542 (1791) (nomen conservandum); Endl. Gen. Plant. no. 2270, 368 (1836–1840); Benth & Hook. Gen. Pl. ii. no. 73, 248 (1873); Engl. & Prantl, Nat. Pflanzenfam. iv. Abth. 5, 142 (1890). *Lacinaria* Hill., Veg. Syst. iv. t. 49 (1762); Porter & Britt. Mem. Torr. Bot. Club, v. 313 (1894). *Laciniaria* Hill, Hort. Kew. 70 (1769); O. Ktze. Rev. Gen. i. 349 (1891). *Psilosanthus* Neck. Elem. i. 69 (1790).

Section I. *EULIATRIS* DC. Prod. v. 128 (1836). *Liatris* as limited by Cassini, Dict. Sci. Nat. xxvi. 235 (1823).

Section II. *SUPRAGO* (Gaertn.) DC. Prod. v. 129 (1836). *Suprago* as limited by Cass. Dict. Sci. Nat. li. 385 (1827).

GENERIC CHARACTERS

LIATRIS Schreb. Perennial herbs, generally from ovoid or globular corms, but sometimes with much flattened or quite elongate rootstocks; leaves elongate, linear to ovate-lanceolate, sessile or petiolate, more or less conspicuously punctate with impressed and resinous dots, the radical leaves usually much longer than the cauline; stems with numerous spirally arranged leaves, these diminishing upwards as bracts subtending flower-heads: heads of flowers in cymosely disposed spikes, racemes or panicles, rarely a loose open cyme; the heads of 3 to numerous (up to 70) similar, tubular flowers on a naked receptacle surrounded by an involucre of imbricated phyllaries in several series: phyllaries lanceolate, ovate, oblong or orbicular; mucronate-, acute-, or obtuse-tipped, herbaceous, narrowly or broadly petaloid with ciliate or deeply erose margins: corolla phlox-purple, or rarely white, regular, usually glabrous without, commonly dotted with scattered resinous droplets; tube cylindrical, usually exceeding the pappus, or twice as long as the pappus; throat hardly at all or slightly perceptible, glabrous within or with little or much pilosity; lobes 5, equal, ovate, acute, erect, or more or less spreading, glabrous or pilose within: stamens 5, included, filaments filiform, equally inserted below the middle of the corolla-tube, glabrous or with tiny outgrowths; anthers short, oblong, about as long as the filaments: style stiff, bifid and exserted after anthesis: achene somewhat cylindrical but pointed at base, about ten-ribbed, pubescent on ribs and more finely between ribs: pappus of 12–40 bristles, sessile in one or more series, plumose or barbellate.

North American herbs: United States, although not west of the Rocky Mts., southern Canada, and most northerly Mexico.

THE SPECIES

Thirty-two species with their varieties and ten hybrids, have been here recognized, though the number of the latter is not definitive. In some cases the wide variety in individuals of an interspecific hybrid has made description impossible. As there is much evidence of intermediate material it is a genus in which it is difficult to draw sharp lines of distinction between the species.

The greatest number of species occur in Florida, at least twelve being known from that state. At the western limits of extension, as in the states of Colorado and Montana or in the province of Alberta, there are probably two species, *L. punctata* Hook. and *L. ligulistylis* (Nels.) K. Sch. In the New England States there is probably but one species, *L. borealis* Nutt. ex MacNab and some intergradations with the species of adjacent districts. In southern Ontario, two species and one stable hybrid occur in the sandy stretches along Lake Erie and southern Lake Huron, *L. cylindracea* Michx., *L. aspera* Michx., \times *L. sphaeroidea* Michx. and a third species, *L. spicata* (L.) Willd., only in a limited region along Lake St. Clair. A few species, such as those of the series *Spicatae* (except *L. microcephala* (Small) K. Sch.) and occasional ones, such as *L. ligulistylis*, grow in low grounds around ponds or even in wet lands. Most of the species, however, grow in warm sandy places, as in remaining oak-hickory forests or, as across Texas, along dry railroad tracks. Other species, e. g. *L. turgida* Gaiser, have been more limited to the mountains of the Carolina region, where the Appalachian ranges have harbored a rich assortment of species and extensive colonial growth.

GROSS MORPHOLOGY

UNDERGROUND STEM. Being perennial plants, all species of *Liatris* have a thickened underground stem from which fibrous roots spread out to anchor the plant. During the first summer of the seedling's growth there develop a few radical leaves above what appears as a slightly thickened tap-root, but at the end of the season an apical bud is developed from a small crown and this, in the second year, produces the first flowering stalk. During

successive summers the stem thickens, becoming globular or remaining ovoid in most species of all series, except the *Spicatae*, *Pycnostachyae* and some of the *Punctatae*. Very singular is the clustered, slender, tuberous formation of *L. Garberi* A. Gray. Except for the roots that come off basally and the buds that develop annually from the central summit into aerial stalks, this stem lacks any investment, such as a membranous scaly coat, and could be spoken of as a naked corm, *sensu* Gray (Gray's Bot. Textb. i. 61–2 (1879)). In accordance with this interpretation we have chosen to use the term corm. In one species there occurs a variation of the generally rounded depressed shape, which appears definitely related to soil conditions. In *L. elegans* (Walt.) Michx., as it is found from Florida westward through the Southern States to Texas and Arkansas, the underground part is commonly small and globular or subovoid. However, specimens from the Carizzo region of Texas, with no marked distinguishing difference of above-ground parts, show an elongated tap-root-like growth up to ten times the usual length of the small ovoid form. Mr. Parks of College Station, in describing this region, writes as follows¹:

“The Carizzo sand is an outcrop of the Carizzo formation of the Eocene Age. In Medina, Bexar, and Wilson counties it is a very conspicuous part of the landscape. There is a wooded ridge reaching a height of nearly two hundred feet above the surrounding country. It is a sand dune covered by a climax oak-hickory association. The soft white sand in which the trees grow bears very little vegetation, however in the spring and late fall when the rains occur it is very prolific of annual plants which are of a very short existence. It is needless to say that most of these plants have deep tuberous roots”.

Thus it seems clear that, in common with other plants of the region, the effects of varied soil conditions are shown in the modification of shape in the subterranean growth of *L. elegans* and such plants are here recognized as a variety (var. *carizzana*).

In some of the species of the *Spicatae* and the *Pycnostachyae* series, the corm, while growing slightly deeper, broadens comparatively more during the successive years, sometimes to a width of 10 centimeters or more, thus providing a widened crown from which many flower-stalks arise. Such plants have been found to live for more than fifteen years, probably representing the

¹ By private communication.

hardest of the shallow-rooted species, which advantage, along with the provision of numerous flowering spikes, makes them the favored species in perennial flower-borders. Some buds of broad, old stems grow into new corms and upon separation or death of the old become new individuals¹.

Some species, yet not all, of the *Punctatae* series show a more pronounced elongation during the thickening of the young seedling's subterranean growth into a tough rootstock that grows into the soil, often to the depth of 50 cm. or more. Rarely there has been found a modification of it into a somewhat more prostrate rhizome which sends off aerial shoots at points along its surface, as in *L. densispicata* Bush, in the Anoka sand-dunes of Minnesota. Lack of any such elongation helps to mark off, we believe, such species as *L. mucronata* DC. and *L. angustifolia* Bush from *L. punctata* with which they have been confused.

In the course of a study of internal secretions of some of the *Compositae* Mayberry (Sc. Bull. Univ. Kans. xxiv. 8 (1936)) described resinous secretory canals in the cortex of the underground stem, as large pockets, 0.9 mm. in diameter, in three species of *Liatris* (*L. pycnostachya*, *L. punctata* and *L. aspera*). In the roots, aerial stems and leaves less conspicuous canals, from .03 to .01 mm. in diameter, were also reported.

LEAF. The leaves of most of the species are linear or lanceolate, though in some they are obovate or ovate-lanceolate. The early radical leaves, coming from the crown, are usually much longer than the cauline ones. The latter arise spirally around the flowering stalks and generally show a reduction in length from the base of the stem upwards as they become the subtending bracts of the axillary flower-heads. In some species, however, the leaves are abruptly shortened and there results a long strict spike with setaceous bracts which hardly project beyond the flower-heads. Commonly the leaves are sessile; but sometimes the broader basal leaves are narrowed into a petiole. The leaves are generally firm; in some linear forms they are even coriaceous, as in *L. laevigata* Nutt., though in broader forms they are less so. All variations from glabrous to scabrous blades are found and in many cases within a single species. For example, there can be

¹ In the series *Spicatae* a number of horticultural names have arisen, which have not been exhaustively treated here.

associated with the more distinctive characteristics by which we recognize the species *L. ligulistylis*, such as the few large heads with erect, loose phyllaries, any condition from the complete lack of to a complete covering of hairs on upper and lower surface of the leaves. Thus pubescence has been found to be of little use as a character for specific differentiation. In all species, not only in those of the *Punctatae* series, the leaves have small sunken resinous glands but they may be less conspicuous in some than in others. Pubescence of the leaves may or may not be accompanied with cilia along the margin of the leaf.

INFLORESCENCE. After a period of producing radical leaves, the flowering stalks appear singly on young, or severally (in groups of 2–20) in larger, older plants where a broader crown has developed. These stems are often stiff, tall and erect (as in *L. spicata* and *L. pycnostachya*), and the floriferous portions, being covered with numerous closely-developed flower-heads, have been commonly spoken of as spikes, though the development is determinate rather than indeterminate, and they are therefore false spikes. In all species the apical flower-head is the first to open. All variations from strictly sessile, through short-pedicellate to long-branched-pedunculate flower-heads occur. In many (as especially in the *Scariosae*) there is found variation from a straight spike-like to a pyramidal and paniculate inflorescence, the result of a gradation from the apically sessile flower-heads successively through longer-pedicellate ones to those low-ermost which have become very much elongated- and branched-pedunculate. In some species the stems are more slender and tufted with flower-heads more scattered in a raceme-like arrangement which, being again determinate, is correctly a racemiform cyme. In one species (*L. cymosa* (H. Ness) K. Sch.) there is considerable branching and the large flower-heads are borne more distantly in a loose dichotomous cyme-arrangement, giving quite a different appearance from that generally found in the genus. However, that there are intermediate conditions between this and the false spikes, when the less proximate heads occur in a rhipidial cyme-arrangement, is seen in *L. cylindracea* (to which series we have attached *L. cymosa*), and *L. squarrosa* (L.) Willd. of the closely related series. Thus, though for strict correctness the inflorescence should be spoken of as reversely or

falsely spicate and a reversed or determinate raceme, it is expected that the explanation here will suffice to permit an understanding of the unqualified terms used throughout the discussion of the genus. The rachis of the inflorescence is sometimes glabrous and may be striate, as exemplified in *L. microcephala*. More frequently it is pubescent above and glabrous below, though occasionally the entire stalk is puberulent or covered with pubescence of short cinereous or longer hairs.

FLOWER-HEAD. The heads in *Liatis* contain from 3-4 to 50-70 flowers. Exceptional are the terminal heads¹, which regularly have a greater number of flowers in almost all species. In some species there is a marked increase in the apical head, as in *L. ligulistylis*. In certain species which normally have few heads, such as *L. cylindracea* and *L. squarrosa* (L.) Willd., reduction to one-headed specimens often occurs, perhaps under unfavorable conditions. This has given rise to naming one-flowered varieties, which seems inadvisable to the author. Also in other species having a generally spicate inflorescence of numerous close heads occasional specimens show terminal ones very much larger than the rest, as, for instance, in *L. punctata* var. *turgida* Lunell (Amer. Mid. Nat. v. 241 (1918)). Since specimens with such exceptional terminal fusion of heads have been found to occur in different species, again varietal ranking has not here been recognized. Heads having few flowers may be short, cylindrical, ca. 6-8 mm. long in *L. microcephala*, or quite long and cylindrical as in *L. punctata*—ca. 1.5-2 cm. long. With more flowers per head, as in the *Graminifoliae* series, where approximately one dozen is an average number, the stoutish cylindrical buds give, when the flowers open, heads that are somewhat turbinate in shape. Many-flowered heads are hemispherical, ovoid or almost globular, their outward appearance varying, largely due to the nature of the phyllaries. Measurements given were taken, whenever possible, from heads with open flowers, the width at the tip of the corolla and the length from there to the base of the head.

In species of *Liatis* there is a wider variation in the form of the phyllaries than of the leaves. In those of few-flowered heads

¹ In stating the number of flowers per head in any description of species, heads other than the terminal one, being more uniform, are referred to.

there may be small outer foliaceous, linear or ovate, closely appressed bracts that become gradually more membranous and generally more elongate inwardly. They may, however, vary generally from acute or mucronate to obovate, and may be glabrous, punctate or pubescent. They may also become recurved and slightly colored, though rarely are they petaloid. In the exceptional *L. elegans* (Walt.) Michx., the phyllaries have become much elongated and colorful, either pink or white and, being loosely arranged, give an altogether distinctive appearance. In species with many-flowered heads there occur the same variations in shape, margin and texture of the many phyllaries as in those with few-flowered heads. But there have developed as well many petaloid forms, many of which, without further classification, have sometimes been ascribed to *L. scariosa*, which had thus become a fine "melting pot". In *L. ligulistylis* these petaloid phyllaries with deeply erose margins stand loosely erect. In *L. aspera* Michx. a combination of petaloid and crisped condition is found. In other species, as *L. borealis*, there is only a narrow scarious margin which may become finely ciliolate, and the phyllaries stand loosely erect, while in *L. scariosa*, phyllaries of similar margin may be recurved. The endless intermediates and variations between these prime types has given rise to much confusion. In *L. squarrosa* (L.) Willd. where the recurved condition of the phyllaries has not been accompanied with petaloid development, intermediates between the appressed and the squarrose types have likewise been numerous. In *L. pycnostachya* Michx. the degree to which the phyllaries are reflexed also varies. In the *Spicatae* and *Pycnostachyae* series there is considerable variation from colorful to strictly green herbaceous involucre but care must be taken to compare specimens of the same age since, after flowering time when the seeds mature, phyllaries that had color usually lose it and become green.

FLOWER. *Corolla.* The corolla is tubular, slightly dilated upwards, with an almost imperceptible narrowing at the throat, and with ovate to lanceolate, acute lobes from $\frac{1}{4}$ – $\frac{1}{3}$ the length of the tube. The length¹ of the corolla varies from ca. 5 mm. in smaller species to ca. 20 mm. in members of the *Squarrosae* series. The wide-spreading lobes of two sections represented by

¹ Measurements were made after boiling the corolla.

L. squarrosa and *L. cylindracea*, having the largest corollas, have, since the time of Nuttall's observation "internally villous" (Nutt. Gen. ii. 132 (1818)), been characterized as "hairy within" (Gray, Man. Bot. ed. 7). Colorless cellular outgrowths, ca. 2 mm. long in *L. cylindracea*, can be seen projecting along the margin of the lobes in fresh flowers without the aid of a hand-lens. The throat of the corolla-tube of many species appears almost translucently clear both in pressed and fresh specimens, but in others does not. Within the tube of all species, five stamens, having filaments about equal in length to the laterally united anthers, are inserted about the middle of the throat. By splitting the tube with a fine needle and examining it with a dissecting lens, small colorless cellular hair-like outgrowths ca. 50-100 μ long (which is only a fraction of the length of those on the lobes of *Squarrosae* species) are sometimes found to be abundant about and below the region of stamen-attachment in the throat. In one series, *Tenuifoliae*, smaller outgrowths come from the filaments. Quite unexpectedly, the presence of this pilosity within the throat of the corolla proved to coincide with other diagnostic characters in some pairs of species that were otherwise difficult to separate, and specific differentiation was thereby strengthened: as, for example, *L. spicata* without and *L. graminifolia* (Walt.) Willd. with hairs; or *L. ligulistylis* without and *L. aspera* with hairs. Care must be exercised since on hasty examination fungal filaments, sometimes found in herbarium specimens might be mistaken for such pilosity.

Commonly on microscopic examination of herbarium specimens, tiny resinous droplets are seen distributed over the corolla, but, as the occurrence of such probably transitory secretions was not consistent for all specimens of a species, no proof of their lack in any species was found.

COLOR. *Liatris* flowers are all of approximately one color, somewhere near phlox-purple by Ridgway's color chart, though they vary in intensity of the shade, except for the occasional white forms. The latter differ in no way from the species' descriptions except for the corolla-color. The one general exception is in *L. elegans*, where the phyllaries, which are so much

¹ A singular example of a yellow corolla is found in *L. elegans* f. *Fisheri* Standley (Field Mus. Pub. xi. 275 (1936)), a plant with "both the flowers and the long petal-like tips of the bracts lemon-yellow in color".

expanded and which add much beauty, as the name of the species suggests, to the heads are white and green accompanying white or mauve-tinted flowers, or there may be pinkish-green bracts accompanying the white flowers. Through southern Arkansas and Texas, where I have observed the species, the white- and purplish-flowered plants seemed equally abundant and successful and yet but one species could be recognized. The author's experience in transplanting white-flowered forms of at least four other species along with those of normal color (*L. aspera*¹, *L. punctata*², *L. spicata*³, and *L. cylindricea*⁴), has been that the white forms never survive longer than about one year after transplantation, though the companion plants of normal color have lived on for a number of years. This experience was borne out by that of Mr. A. C. Edinborough⁵ of Baljennie, Saskatchewan, who transplanted the white-flowered form of *L. punctata* to soil similar to that of its native habitat in the Eagle Hills. Apparently, in species of *Liatris* the white-flowered forms merely represent weaker mutants; they are therefore not being given varietal rank.

Apart from the reference to one sweet-scented variety, *Lacinaria scariosa* var. *trilisioides* Farwell (Rep. Mich. Acad. Sci. xvii. 170–171 (1916)), which has not been encountered, only one species, *L. tenuifolia* Nutt., has been reported⁶ as noticeably fragrant. Where hundreds and thousands of plants grew the air was said to be “delicately scented, much like that of the *Buddleia* slightly modified, and sufficient to arrest one's attention”. The observer noticed that many butterflies and bees had been drawn to the spot and also that the three albino plants found in the region were likewise fragrant.

FRUIT. The fruit of *Liatris* is a ribbed, somewhat cylindrical achene, finely pointed at the base, varying in length from ca. 3 mm. in some species to ca. 10 mm. in the largest. In color, as in size, considerable difference can be noted between unfilled fruits and completely matured ones, and therefore care must be taken when giving color from examination of herbarium speci-

¹ Found near Pt. Edward, Lambton Co., Ontario, Aug. 26, 1938, no. 168.

² Received from Mr. A. C. Edinborough, Baljennie, Sask. Aug. 24, 1939, no. 202, pl. 1.

³ Found at Walpole Is., Lambton Co., Ontario, Aug. 26, 1938, no. 166.

⁴ Found at Turkey Point, Norfolk Co., Ontario, Aug. 27, 1940, no. 213.

⁵ By private communication.

⁶ By private communication from Mrs. H. T. Butts, Ormond Beach, Fla. Oct. 1944.

mens. Mostly the mature achenes are of a brown color, but in some species they approach black. The number of ribs was not uniform; in most specimens ca. 10 was the average. In all species the achenes are pubescent along the ribs and more finely and inconspicuously so between the ribs. Though in some cases achenes showed angles, appearing as if developed by close approximation during growth, no specific coordination could be found.

PAPPUS. One must be careful in stating the color of the pappus, since if not mature, it is colorless, as in *L. ligulistylis*, but purple when mature.

There is considerable difference in the appearance of the pappus of *Liatris* species. In *L. punctata* for instance, the tuft of bristles appears feathery or plumose to the naked eye. Upon closer examination there are found 20–30 setae, from 8–10 mm. in length, with lateral cilia considerably longer than the diameter of the seta, a condition called *setose-plumose* by J. Small, New. Phytol. xvi.–xviii. (1917–1919). The bristles are arranged indefinitely in one to two series. In other species, for example *L. gracilis* Pursh, where there are 30–40 bristles 4–5 mm. long per achene, there is no downy appearance, as the setae have projecting outgrowths about as long as, or only slightly longer than, the diameter of the seta—this called *setose-barbellate* (Small, l. c.). This character was used by Cassini in the division of the genus into three subgenera, two of which, *Suprago* and *Euliatris*, were made sections by DeCandolle; the third is now a separate genus, *Tribisa* DC. These sectional divisions of the genus are here retained.

Though there is never uniformity in the length of all the bristles of an achene, the over-all length of the pappus, obtained by measuring the longest bristles, generally exceeds the length of the achene, and is shorter than, or about equalling, the corolla. In a few cases as in *L. Helleri* Porter, it is only about half the length of the corolla-tube.

KEY TO THE SECTIONS AND SERIES

- a. Pappus barbellate, the lateral cilia only 3–6 times the diameter of the seta, so that they are hardly visible without the use of a lens. Section I SUPRAGO (Cass.) DC. . . . b.
- b. Heads 3–20-flowered, oblong, with phyllaries mostly erect. . . . c.
- c. Inflorescence spicate, the heads mostly sessile; leaves numerous, gradually reduced to bracts subtending the heads; no pilosity within the corolla-tube. . . . d.

- d. Phyllaries obtuse, appressed and never recurved. SPICATAE.
- d. Phyllaries acuminate and recurved at the tips. PYCNOSTACHYAE.
- c. Inflorescence loosely spicate or racemose, with sessile or variously peduncled heads; corolla pilose within the tube. e.
- e. Phyllaries obtuse, ciliolate; inflorescence frequently paniced; heads 5-15-flowered. GRAMINIFOLIAE.
- e. Phyllaries lanceolate-acuminate, appressed to the tips, not ciliolate; heads 3-5-flowered. PAUCIFLORAE.
- c. Inflorescence spicate, with the basal rosette of leaves changing abruptly to setaceous bracts; corolla-tube not pilose, but with short hairs on the filaments of the stamens; heads with 3-6 flowers and few loosely erect phyllaries. TENUIFOLIAE.
- b. Heads 15-70-flowered, hemispheric; the numerous broad phyllaries loosely erect, bullate or partly recurved; corolla pilose within the tube (except in *L. ligulistylis*) SCARIOSAE.
- a. Pappus plumose, the lateral cilia 15 or more times the diameter of the seta, so that these appear plumose to the naked eye. Section II EULIATRIS (Cass.) DC. f.
- f. Heads 4-8-flowered, slender-cylindrical; inflorescence spicate. g.
- g. Phyllaries with prolonged petaloid tips; corolla not at all pilose within. ELEGANTES.
- g. Phyllaries herbaceous and appressed, or with tips only free; corolla quite pilose within the tube. PUNCTATAE.
- f. Heads 15-60-flowered, of more nearly isodiametric-cylindrical proportions; inflorescence loosely cymose to cymose-racemose. h.
- h. Phyllaries appressed. CYLINDRACEAE.
- h. Phyllaries recurved or loosely spreading. SQUARROSAE.

DESCRIPTION AND CLASSIFICATION OF THE SPECIES

SERIES I. SPICATAE. Mostly glabrous plants with numerous spikes from globular to large-crowned, perennial stocks; leaves linear, gradually diminishing upwards from the long basal ones; heads numerous, 4-18-flowered, 1-1.5 cm. long with phyllaries erect, oblong, mostly obtuse, appressed, never recurved; corolla-tube non-pilose within; achene 4-7 mm. long.—From New York and southern Ontario to South Dakota and Colorado, south to Florida, the Gulf States and New Mexico, with only one species not of moist habitats.

- a. Flowering stems stout, 6-15 dm. high; spikes dense; heads 4-18-flowered; phyllaries mostly obtuse. b.
- b. Plants with narrowly linear leaves; on moist meadows or in damp woodlands east of the Mississippi. 1. *L. spicata*.
- b. Plants with broadly linear leaves; on the bottomlands in the Western Plains States and the mountains of New Mexico. 2. *L. lancifolia*.
- a. Flowering stems more flexible, 3-8 dm. high; head 3-6-flowered; phyllaries obtuse, obtuse-mucronulate or acuminate. c.
- c. Glabrous plants; corms rounded. d.

- d. Phyllaries narrowly oblong, obtuse; leaves narrowly linear, diminishing gradually upwards; more tufted plants with several stems of fewer heads in racemes
3. *L. microcephala*.
- d. Phyllaries ovate to lanceolate, acuminate; basal leaves long, narrowly linear, the upper cauline ones abruptly changing to short subulate blades; plants of 1-4 spicate stems. 4. *L. acidota*.
- c. Hirsute plants; roots elongated and tuberous; spicate; phyllaries oblong and obtuse-mucronulate; from South Florida only. 5. *L. Garberi*.

1. *LIATRIS SPICATA* (L.) Willd. Rootstock globose in young plants, enlarged and shallow in old plants by separation of parts permitting considerable vegetative propagation: stems stiff and tall, 6-15 dm. high, glabrous, only rarely hirsute: leaves numerous, linear or linear-lanceolate, glabrous or sparingly hirsute along the veins; lower ones 1-4 dm. long, 5-20 mm. wide, gradually shorter toward the summit of the stem: inflorescence a dense spike 3-7 dm. long: heads subcylindrical, 4-18-flowered, usually sessile along the spike, although basal heads may become peduncled, 8-15 mm. long and 5-10 mm. thick at time of flowering; phyllaries appressed, sometimes glutinous, elliptical-oblong, mostly obtuse but sometimes slightly acuminate, herbaceous, glabrous and having a narrow scarious margin frequently purplish at flowering time; corolla phlox-purple, lacking any pilosity within the tube, 6.5-9 mm. long; achene 4-6 mm. long; pappus 5-7 mm. long, barbellate-setose (not plumose to the naked eye).—*Sp. Pl.* iii³. 1636 (1803). *Serratula spicata* L. *Sp.* ii. 819 (1753) (excl. synonymy).

Var. **typica**. A thick-spiked, marsh-loving plant mostly from the more northern latitudes of the range of the species and around mountain lakes and bogs in the southern Appalachian region: stems frequently 5 mm. in diameter at the base and 10-15 dm. tall, glabrous or basally with few scattered hairs: leaves glabrous; the wider basal ones linear-lanceolate, 1 dm. or more long, 5-20 mm. wide; inflorescence usually a dense spike 3-7 dm. long; the heads of 10-18 flowers 1-1.5 cm. long and ca. 1 cm. thick, cylindrical, with an appressed involucre that is sometimes adherent by its glutinous nature; phyllaries glabrous, mostly green or somewhat purplish at time of flowering, with a narrow scarious margin: corolla usually phlox-purple, occasionally white.—*Serratula spicata* L. *Sp.* ii. 819 (1753), excl. synonyms. *Liatrix spicata* Willd. *Sp. Pl.* iii³. 1636 (1803); Andr. Bot. Repos. t. 401 (1804); Curtis's Bot. Mag. t. 1411 (1811); Sweet, Brit. Fl. Gard. ser. 2, t. 49 (1823); Torr. & Gray, Fl. N. Am. ii. 73 (1841); Torr. Fl. N. Y. 325, t. 47 (1842); Gray, Synop. Fl. i². 111 (1884). *L. macrostachya* Michx. Fl. Bor.-Am. ii. 91 (1803). *L. spicata* β. *macrostachya* DC. Prodr. v. 130 (1836). *L. magnifica* Hort.

Hand-List of Herbaceous Plants Cultivated in the Royal Gardens, Kew 263 (1895), *nomen*. *L. spicata* f. *albiflora* Britton, Bull. Torr. Bot. Club, xvii. 124 (1890). *Lacinaria spicata* var. *albiflora* Britton, Mem. Torr. Bot. Club, v. 314 (1894) *Laciniaria spicata* f. *albiflora* House, Bull. N. Y. State Mus. 243-4, 69 (1923). *Lacinaria spicata* var. *foliacea* Farwell, Amer. Mid. Nat. ix. 260 (1925).

Moist or marshy land from Long Island, New York, to Florida, and westward to the Mississippi, from the Lake St. Clair region of Ontario and Michigan to the Gulf of Mexico.—MASSACHUSETTS (possible garden escapes). ESSEX Co.: Lawrence, without collector's name, 1877 (G). WORCESTER Co.: roadside near Quinsigamond, Sept. 21, 1932, N. P. Woodward (G). CONNECTICUT (possible garden escape). Without stated locality, Hitchcock (NY). NEW YORK. ALBANY Co. (possible escapes): sandy plains, near Londonville, Aug. 14, 1937, H. D. House, 24958 (G, NY); near Londonville, Aug. 13, 1934, H. D. House, 21980 (G, NY). SUFFOLK Co.: White Mills, Long Isl., Sept. 19, 1887, J. F. Poggenburg (G). QUEENS Co.: swamps, Woodhaven, Long Isl., Sept. 14, 1892, A. Brown (NY); (albino), Forbell's Landing, Long Isl., Aug. 29, 1890, G. D. Hulst (NY). PENNSYLVANIA. Without stated locality: Aug. 1832, C. J. Moser (NY). BUTLER Co.: low field, Aug. 8, 1923, S. S. Dickey, 76 (G). BUCKS Co.: near Argus, Ridge Valley, Aug. 14, 1923, C. D. Fretz (G). MONTGOMERY Co.: thicket in old brick-yard near West Telford, Aug. 23, 1909, W. M. Benner (G). DELAWARE Co.: open woods, Aston Mills, Oct. 16, 1926, F. W. Pennell, 13118 (NY). BERKS Co.: rather moist soil in a low meadow, 2.4 mi. n. e. of Geigertown, Aug. 1, 1942, W. C. Brumbach, 3388 (G); CHESTER Co.: Oxbow of Octoraro Creek, above Octoraro, Sept. 23, 1928, F. W. Pennell, 14607 (NY); LANCASTER Co.: without stated locality, Aug. 1858-64, S. P. Sharples (G), Sept. 18, 1868, T. C. Porter (US). YORK Co.: McCall's Ferry, Sept. 9, 1893, A. A. Heller & E. G. Halbach, 1273 (NY, US); dry woods, McCall's Ferry, Sept. 2, 1898, A. MacElwee (US). NEW JERSEY. Without stated locality, A. Gray (G), P. D. Knieskern (G). SUSSEX Co.: Franklin Furnace, Aug. 1, 1884, O. E. Pearce (US); Aug. 15, 1895, W. N. Van Sickle (US). PASSAIC Co.: Clifton (white form), Aug. 18, 1891, G. V. Nash (NY); moist ground along rwy., Newfoundland, Aug. 3, 1893, W. M. Van Sickle (US). SOMERSET Co.: in rich woods, Watchung, Aug. 8, 1930, H. Moldenke, 1358 (NY); in field at edge of woods, on First Mt., Watchung, July 31, 1937, H. Moldenke, 9996 (NY); along roadside, in woods, Watchung, Aug. 1, 1924, H. Moldenke, 2111 (NY); near Bernardsville, (forma *albiflora*), Aug. 12, 1890,

¹ A note on this sheet states: "spreading from cultivation", so that it seems probable that when introduced in a favorable location, this species may become naturalized.

Miss A. M. Vail (NY). MIDDLESEX Co.: Perth Amboy, Aug. 25, 1893, *L. H. Lighthipe* (US). OCEAN Co.: Bayhead, Barnegat Bay, Aug. 24, 1892, *J. R. Churchill* (G); Bayhead (forma *albiflora*), Aug. 29, 1890, *L. H. Lighthipe* (NY); border brackish marsh, 2 mi. e. of Manahawkin, Aug. 13, 1936, *J. M. Fogg*, 11172 (G). DELAWARE. NEWCASTLE Co.: near Delany's Chapel, Sept. 1899, *W. M. Canby* (G). KENT Co.: Brandywine, 1843, *E. Tatnall* (G). MARYLAND. BALTIMORE Co.: Catonsville, Aug. 10, 1873, *Morong* (NY), *E. Foreman* (NY). VIRGINIA. Without stated locality: *Dr. Bauer* (NY). FAIRFAX Co.: (possible escape), near mouth of Difficult Run, Sept. 25, 1909, *F. W. Pennell* (US). MONTGOMERY Co.: Blacksburg, Aug. 3, 1895, *W. A. Murrill* (NY). GILES Co.: Brush Mt., 2 mi. e. of Newport, Aug. 30, 1933, *E. J. Alexander*, *J. H. Everett*, & *S. D. Pearson* (NY). WEST VIRGINIA. HAMPSHIRE Co.: Millbrook, Aug. 11, 1940, *W. M. Frye*, 154, 157 (NY). FAYETTE Co.: Nuttall, Aug. 11, 1891, *C. F. Millspaugh*, 1115 (NY); New River, Cotton Hill, July 6, 1929, *W. V. U. Biol. Exped.* (G). NORTH CAROLINA. BUNCOMBE Co.: slopes of Cedar Cliff Mt., Aug. 24, 1897, *Biltmore Herb.*, 579 d (NY, US); Biltmore, Aug. 1894, *Biltmore Herb.* 579 (US). HENDERSON Co.: Hendersonville, Aug. 22, 1891, *J. D. Smith* (G, US). TRANSYLVANIA Co.: Green Knob in Pisgah Forest, Aug. 1908, *H. D. House*, 3682 (G). SOUTH CAROLINA. KERSHAW Co.: Camden, July 27-28, 1906, *H. D. House*, 2658 (NY, US). BEAUFORT Co.: Beaufort district, 1882, *J. H. Mellichamp*, 399 (US); Bluffton, 1886, *J. H. Mellichamp*, 9, 10 (US); GEORGIA. CATOOSSE Co.: Chickamauga Creek, near Springgold, Aug. 6-12, 1895, *J. K. Small* (NY, US). DADE Co.: along C. & D. Rwy., Lookout Mt., July, 1898, *A. Ruth*, 675 (NY); Lookout Mt., July, 1898, *A. Ruth*, 658 (US). RICHMOND Co.: Augusta, 1832, *Drummond* (G). SUMTER Co.: sandy bog, Aug. 26, 1896, *R. M. Harper* (NY). COLQUITT Co.: moist pine barrens, between Moultrie & Kingwood, Sept. 22, 1902, *R. M. Harper*, 1652 (NY). FLORIDA. Without stated locality, *ex. Herb. Chapman*, Columbia College (NY). FRANKLIN Co.: Apalachicola, Aug. 20, 1872, *Biltmore Herb.*, 579 b (G). BAY Co.: open sandy moist ground, Lynn Haven, Oct. 12, 1911, *C. Billington*, 168 (US). WALTON Co.: boggy places, in pine barrens, Argyle, Oct. 2, 1901, *A. H. Curtiss*, 6923 (G, NY); moist soil, in pine barrens, Crestview, April 21, 1899, *Biltmore Herb.*, 579 a (US). ORANGE Co.: flatwoods, Vineland, Oct. 17, 1929, *F. Vasku & E. West* (NY). ONTARIO. LAMBTON Co.: meadows, Squirrel Isl., *O. A. Farwell*, 7103 (G, isotype of *Lacinaria spicata* var. *foliacea*); Sarnia, Aug. 11, 1894, *C. K. Dodge* (G, Ot); borders of marshes, Pt. Edward, R. St. Clair, Aug. 11, 1884, *J. Macoun* (G, Ot); marshes, Pt. Edward, Aug. 12, 1901, *J. Macoun*, 26616 (NY, Ot); meadows on Squirrel

Isl., Sept. 3, 1924, *O. A. Farwell*, 7102 (G). ESSEX Co.: Sandwich, July 27, 1901, *J. Macoun* (G, NY); damp thickets, Sandwich, Aug. 4, 1892, *J. Macoun*, 22751 (G, NY, Ot); near Mineral Springs, Windsor, July 31, 1894, *A. W. Cody* (Q). MICHIGAN. TUSCOLA Co.: near shore of Lake Huron, 9 mis. e. of Bay City, Aug. 3, 1940, *H. A. Gleason*, 9913 (NY). KENT Co.: Grand Rapids, Aug. 3, 1886, *A. A. Crozier* (US, ND). ST. CLAIR Co.: banks of Governmental Canal, Lake St. Clair, July, 1893, *T. Morong* (NY); Port Huron, *C. K. Dodge*, Aug. 6, 1896 (G); Aug. 11, 1894 (NY); Fort Gratiot (within Port Huron), 1829, *Dr. Pitcher* (NY). OAKLAND Co.: near Lake Orion, Aug. 3, 1913, *B. F. Chandler* (US). WASHTENAW Co.: low marshy meadow, 1.3 mis. e. of Dexter, Aug. 20, 1937, *F. J. Hermann*, 9141 (G, NY, US). JACKSON Co.: Watkins Station, Aug. 4, 1892, *C. F. Wheeler* (US); low ground, 10 mis. s. of Jackson, Aug. 24, 1906, *S. H. Camp & D. R. Camp* (US); without stated locality, Aug. 12, 1896, *S. H. Camp & D. R. Camp* (US). KALAMAZOO Co.: swampy soil, n. of Pawpaw Lake, Texas twsp., July 23, 1930, *C. R. Hanes* (NY); n. of Pawpaw Lake, the "Mud Hole" $\frac{1}{2}$ mi. s. e. of Vicksburg, Aug. 8, 1940, *F. W. Rapp*, 3625 (NY). OHIO. ERIE Co.: Castalia prairies, Aug. 7, 1895, *E. L. Moseley* (US). LUCAS Co.: Dorr St., Toledo, Aug. 4, 1920, *E. L. Moseley* (G). LORAIN Co.: Lorain to Huron, Aug. 24, 1924, *R. J. Webb*, 5476 (G), Aug. 24, 1924, *R. J. Webb & G. A. Cook*, 1612 (G). STARK Co.: south swamp, Canton, Aug. 1912, June 25, 1912 (No. 13) *Mrs. F. E. Case* (US). CHAMPAIGN Co.: without stated locality, Aug. 9, 1893, *W. C. Werner* (NY). PICKAWAY Co.: Kibler's bog, $\frac{1}{2}$ mi. s. of Circleville, July 28, 1936, *Bartley & Pontius*, 39 (NY). MONTGOMERY Co.: Dayton, Aug. 15, 1881, *A. Foerste* (US). ROSS Co.: Frankfort (some white), Aug. 9, 1935, *D. Demaree*, 11496 (G, US). INDIANA. Co. UNDETERMINED: low ground, e. of Chicago, Aug. 30, 1891, *W. S. Moffatt*, 1627 (US). LAKE Co.: moist prairie $\frac{1}{4}$ mi. n. of Griffith, Aug. 29, 1916, *C. C. Deam*, 21324 (US); moist prairie ditch, $\frac{1}{4}$ mi. n. of Griffith, Aug. 29, 1916, *C. C. Deam*, 21330 (US); Hammond, old beaches "Lake Chicago", Sept. 14, 1909, *E. S. Steele*, 147 (G, US); Buffington to Pine, old beaches "Lake Chicago", Sept. 20, 1909, *E. S. Steele*, 181 (G); open place in oak woods, $\frac{1}{2}$ mi. n. of Griffith, Aug. 29, 1916, *C. C. Deam*, 21342 (US); Whiting, Aug. 29, 1893, *N. L. Britton* (NY); dry sands, Pine, Aug. 31, 1895, *L. M. Umbach* (US); low sands, Pine, Aug. 27, 1897, *L. M. Umbach* (US); swales, Pine, Aug. 19, 1898, *L. M. Umbach* (US). NOBLE Co.: low sandy and marl border, Eagle Lake, Sept. 14, 1916, *C. C. Deam*, 21889 (US). MARSHALL Co.: Lake Maxinkuckee, July 12, 1899 (No. 731), July 28, 1899 (No. 848), *B. W. Evermann*, (US); near Lake Maxinkuckee, 1900, *J. T. Scovell & H. W. Clark*, 1430 (NY, US), Aug. 26, 1900, *J. T. Scovell & H. W.*

Clark, 848 (NY); Plymouth, Sept. 21, 1909, *H. W. Clark* (US). STARKE Co.: low sandy border, s. e. side of Bass Lake, Aug. 22, 1916, *C. C. Deam*, 21084 (US); open places in sandy woods, s. e. side of Bass Lake, Aug. 22, 1916, *C. C. Deam*, 21038 (US); sandy soil, Sept. 28, 1940, *C. M. Elk* (NY). NEWTON Co.: fallow sandy field, 5 mis. n. & 1 mi. w. of Enos, July 27, 1940, *R. C. Friesner*, 14697 (NY). TIPTON Co.: w. of Goldsmith, Aug. 2, 1913, *Mrs. C. C. Deam*, 13921 (G, US); along the right of way of Erie Rwy., $\frac{1}{2}$ mi. w. of Goldsmith, Sept. 3, 1914, *C. C. Deam*, 15362 (NY). ILLINOIS. McHENRY Co.: (albino), *McHenry*, Aug. 23, 1935, *H. C. Benke*, 5760 (G). COOK Co.: Chicago, *H. H. Babcock*, 1860, *Dr. Scammon* (NY, US); South Chicago, 76th & Stoney Isl., Aug. 4, 1913, *H. H. Smith*, 5737 (G); waste places, Chicago, Aug. 16, 1897, *L. F. Ward* (US); in vacant lot, Chicago, Sept. 2, 1893, *L. F. Ward* (US); near Pullman, Aug. 27, 1893, *G. B. Sudworth* (US); W. Pullman, near 119th St., Aug. 8, 1907, *J. M. Greenman*, 1972 (G); along rwy., Lake Villa, Aug. 10, 1906, *H. A. Gleason & F. D. Shobe*, 243 (G); wet intervals, old beaches, Indiana Harbor, Sept. 15, 1909, *E. S. Steele* 148 (US); Cicero, July 20, 1896, *Mrs. A. Chase* (NY); Riverdale, Aug. 1909, *J. M. Greenman*, 2866 (G, US); vacant lot, Evanston, July 4, 1911, *E. E. Sherff* (US); Morgan Park Ridge, Sept. 8, 1907, *R. A. Dixon & C. A. Gage*, 789 (US, Q). KENTUCKY. CALLOWAY Co.: between Murray & Pine Cliff Ferry, July 23, 1937, *L. B. Smith & A. R. Hodgdon*, 4202 (G, NY, US). TENNESSEE. ROBERTSON Co.: rocky hills, Aug. 19, 1897, *H. Eggert* (NY). DICKSON Co.: dry oak barrens, Burns, Aug. 17, 1939, *H. K. Svenson*, 10485 (B). COCKE Co.: 3 mis. w. of Wolf Creek Sta., Aug. 30, 1897, *T. H. Kearney*, 746 (NY). CUMBERLAND Co.: Mayland, Aug. 16, 1934, *Porter & Harbison*, 3059 (NY). VAN BUREN Co.: grassy swamps, between Spencer & Cagle, Aug. 1938, *H. K. Svenson*, 9678 (B). COFFEE Co.: oak barrens n. of Manchester, Aug. 6, 1938, *H. K. Svenson*, 8959 (G, B); swamp, 2 mis. s. of Manchester, Aug. 18, 1940, *H. K. Svenson*, 10606 (B); low fields, near Tullahoma, Aug. 10, 1899, *Biltmore Herb.*, 579e (NY, US); dry oak barrens, Tullahoma, Aug. 24, 1930, *H. K. Svenson*, 4231 (G, P, B). CHESTER Co.: borders of thickets, 1892, *S. Bain* (US); fields, Henderson, *S. M. Bain*, June, 1892 (No. 81) (NY), Aug. 1892 (No. 81) (G). FRANKLIN Co.: wet places in oak barrens, between Tullahoma & Estill Springs, Aug. 13, 1939, *H. K. Svenson*, 10490 (B). ALABAMA. Without stated locality: *M. Lea* (G). HALE Co.: dry chalky prairies, 1 mi. n. w. Rosemary, Aug. 23, 1934, *R. M. Harper*, 3254 (G, NY, US). LEE Co.: Auburn, Aug. 11, 1897, *F. S. Earle & C. F. Baker*, 1160 (NY). BUTLER Co.: grassy pine barrens, near Bolling, Aug. 28, 1885, *J. D. Smith*, 427 (US). HENRY Co.: dryish swamp border, 8 mis. n. of Headland, Aug. 10, 1927, *K.*

M. Wiegand & *W. E. Manning*, 3174 (G). MISSISSIPPI. WAYNE Co.: Waynesboro, Aug. 8-9, 1896, *C. L. Pollard* 1248 (G, NY, US, ND). JACKSON Co.: Ocean Springs, Aug. 14, 1889, *Herb. F. S. Earle* (ND). HARRISON Co.: Biloxi, Aug. 23, 1898, *S. M. Tracy* 4886 (NY). WISCONSIN. KENOSHA Co.: Pleasant Prairie, 3 mi. south of Kenosha, Aug. 7, 1941, *E. P. Kruschke*, K-41-175 (G), K-41-179 (G) (albino). MISSOURI (possible garden escape). ST. LOUIS Co.: St. Louis, July 7, 1910, *E. E. Sherff*, 288 (G). LOUISIANA (possible garden escapes). RAPIDES Co.: Alexandria, *J. Hale* (G). ORLEANS Co.: New Orleans, 1835, *Dr. Ingalls* (NY).

(To be continued)

BETULA GLANDULOSA AT A LOW ALTITUDE IN NEW HAMPSHIRE. —While vacationing in Jackson, N. H., in late September, a few years ago, we drove up the Black Mountain Road, turning right, near Whitney's, into the Dundee Road. After a short way we parked our car in front of a house, on the right side of the road—a house which we used to call "the house with the chimney outside." We walked through the yard, past the house and barn, and went a short distance into an open upland meadow-like pasture, to enjoy the view. This location was on the lower north-east slope of Tin Mountain, possibly 400 feet below the summit, which is only 2025 feet.

As we sat there, I examined the low growth around me, and saw, to my great amazement, what looked exactly like *Betula glandulosa*, which I had never collected before except in the alpine region of the Great Range. However, Professor Fernald has identified the specimens I sent him and this establishes, evidently, an exceptionally low altitude for *B. glandulosa*.—CHARLOTTE ENDICOTT WILDE, Canton, Massachusetts.

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF
HARVARD UNIVERSITY—NO. CLXII.IDENTIFICATIONS AND REIDENTIFICATIONS OF
NORTH AMERICAN PLANTS

M. L. FERNALD

(Continued from page 162)

HABENARIA PSYCODES (L.) Spreng., forma **varians** (Bryan), stat. nov. Var. *varians* Bryan in Ann. Mo. Bot. Gard. iv. 37, pl. 5, fig. B (1917).

H. FIMBRIATA (Ait.) R. Br., forma **mentotonsa**, f. nov., labelli lobo terminali cuneato integro vel apice breviter eroso-dentato; petalis integris.—MAINE: meadow, Hamilton Cove, Lubec, Washington County, August 2, 1909, *Fernald*, nos. 1662d (TYPE in Herb. Gray.), 1662e and 1662g.

Quite like typical *Habenaria fimbriata* but with entire petals and narrowly cuneate entire or obscurely short-dentate or erose terminal division of the lip. Entire petals are frequent in both *H. fimbriata* and the smaller-flowered *H. psycodes*, and the lip of *H. psycodes*, forma *ecalcarata* (Bryan) Dole is entire. At Hamilton Cove *H. fimbriata*, forma *mentotonsa* (with shaved chin) is relatively common, mixed with typical *H. fimbriata*, but I cannot follow Correll who, in Bot. Mus. Lfls. Harv. Univ. vii. 65 (1938), calls this plant the characteristic slender-racemed one with greenish-white or rose-tinted flowers, the hybrid of *H. lacera* (Michx.) Lodd. and *H. psycodes*, the always scanty and relatively insignificant plant known as \times *H. Andrewsii* Marcus White ex Niles, Bog-Trotting for Orchids, 258 with plate (1904).

Correll's vast aggregation of relatively typical *Habenaria psycodes*, *H. fimbriata* and *H. lacera*, var. *terrae-novae* Fern. in RHODORA, xxviii. 21 (1926) under the unsatisfactorily blanketing name \times *H. Andrewsii* can appeal to no field-botanist who for decades has known the various elements involved. Much Newfoundland *H. lacera*, var. *terrae-novae* is included under his remodeled \times *H. Andrewsii*, although no true *H. lacera* is found in Newfoundland, where its smaller-flowered var. *terrae-novae* occurs by thousands on boggy barrens, tundra and treeless alpine areas, almost always apart from *H. psycodes* of richer, often alluvial, thickets and meadows. On Sable Island, 100 miles out-to-sea off

Canso, Nova Scotia, the only Fringed-orchid is *H. lacera*, var. *terrae-novae*.

Very similarly, although *Habenaria fimbriata*, forma *mentotonsa* occurs in eastern Washington County, Maine, it is significant that in the many pigeonholes of Fringed-orchids in the Herbarium of the New England Botanical Club I can find neither *H. lacera* nor *H. psycodes* (parents of true \times *H. Andrewsii*) from that county. Both seem to stop their eastern extension in coastwise Maine in Hancock County, 70–90 miles to the southwest of Cutler.

Similarly, nine tenths of the specimens in the Gray Herbarium and that of the New England Botanical Club which have been annotated (some of them cited) as \times *Habenaria Andrewsii* are characteristic *H. fimbriata* (including the TYPE of *H. fimbriata*, forma *albiflora* Rand & Redfield) or *H. psycodes*. \times *H. Andrewsii*, as well as Fleur-de-lis, Blackberry blossoms, Yellow Clintonia, Indian Pipes, “white, innocent twigs of apple” and other non-orchidaceous plants, was illustrated in Bog-Trotting for Orchids. The life-size photograph shows racemes 2–2.5 cm. thick; and the description calls for “Labellum about $\frac{1}{3}$ – $\frac{1}{2}$ inch [8–12.5 mm.] broad”. In his very detailed account of *H. psycodes \times *lacera*, Andrews, in RHODORA, iii. 246 (1901), said: “Lower leaves as in *H. lacera* . . . , width to 3 cm. . . . Average width of lip about 12 mm. . . . cleft as in *H. lacera* . . . Glands of pollen-masses . . . elliptical or slightly kidney-shaped”, and, on p. 247, “All in all the characteristics of the hybrid seem to show a stronger influence of *H. lacera*”. The distinctive characters of *H. lacera* and of *H. fimbriata*, besides color and dissection of lip, include the following. *H. LACERA*: largest lower leaves 1–3.5 cm. broad; raceme 2–6 cm. thick; perianth 5–6 mm. long; lip 1–1.5 cm. long and broad, its terminal division cuneate into a very slender claw; glands of anther oblong-linear. *H. FIMBRIATA*: largest lower leaves 2.5–9 cm. broad; raceme 5–9 cm. in diameter; perianth 9–12 mm. long; lip 1.5–2 cm. long, 1.8–3 cm. broad, its dilated terminal division short-stalked or subsessile; glands suborbicular. In all except the narrow and fringeless terminal division of its lip *H. fimbriata*, forma *mentotonsa* is very characteristic *H. fimbriata*, growing, as said, far from *H. lacera* or *H. psycodes*. In view of these many considerations it is toler-*

ably certain that the great group of amateur and professional botanists who have assembled the large representation of *H. lacera*, *psycodes* and *fimbriata* in the herbarium of the New England Botanical Club and in the Gray Herbarium, for the most part with correct identifications, have not all been wrong.

CLEISTES DIVARICATA (L.) Ames, var. **bifaria**, var. nov. (TAB. 1048), var. typica recedit planta plerumque 1.5–5 dm. alta pedunculo 0.3–1.6 dm. longo; sepalis longioribus 3–4.5 cm. longis; petalis 2–3 cm. longis, 5–10 mm. latis.—Upland woods, mountain-crests and slopes, Cumberland Plateau and Mountains of Kentucky and Tennessee and Blue Ridge of western North and South Carolina, coming out to peats and pine barrens of the Coastal Plain from eastern North Carolina to Florida, thence to Louisiana. MAP 2.¹ TYPE from summit of Table-rock Mountain, Burke Co., North Carolina, July 2, 1891, *Small & Heller*, no. 285 (Gray Herb., ISOTYPES in several other herbaria).²

Arethusa divaricata L. Sp. Pl. 951 (1753), typonym of *Cleistes divaricata* (L.) Ames, Orchidaceae, vii. 21, pl. 108 (1922), was based on *Serapias radicebus palmato-fibrosis, caule uniflora* of Gronovius from Virginia (photograph before me) and upon Catesby's plate 58 of his *Helleborine Lili folio caulem ambiente*, etc., represented as having an extraordinarily large flower (with sepals 6.4–7.3 cm. long, petals 6–7 cm. long and lip 7 cm. long). The Clayton material, shrunk by drying, is more modest, its dried and distorted sepals up to 4.2 cm. long, petals to 3.6 cm. and lip slightly over 4 cm. long. The Clayton material represents a small-flowered extreme of the plant which locally follows the Coastal Plain from southern New Jersey to northern Florida (MAP 1). The Catesby drawing is presumably exaggerated in size. I have had through the courtesy of the Curators the advantage of studying, besides that in the Gray Herbarium and the Ames Herbarium, all the material at the United States National Herbarium, the New York Botanical Garden, the Academy of Natural Sciences of Philadelphia and the Brooklyn Botanic Garden. These collections show that there are two

¹ Since the map was engraved, specimens from additional stations in the Cumberland Mountains of Tennessee have been sent me for study by Professor Jesse M. Shaver of George Peabody College for Teachers, at Nashville. They add three dots for Tennessee.

² One Florida specimen of 1888, bearing the intriguing data, "wedding trip", has not been entered on the map; neither have I selected it as the type of var. *bifaria* (in two parts or on two sides).



Photo B. G. Schubert

CLEISTES DIVARICATA, all figs. $\times 1$: FIGS. 1 and 2, median leaf and flower from eastern Virginia (type-region); FIG. 3, flower from southern New Jersey.

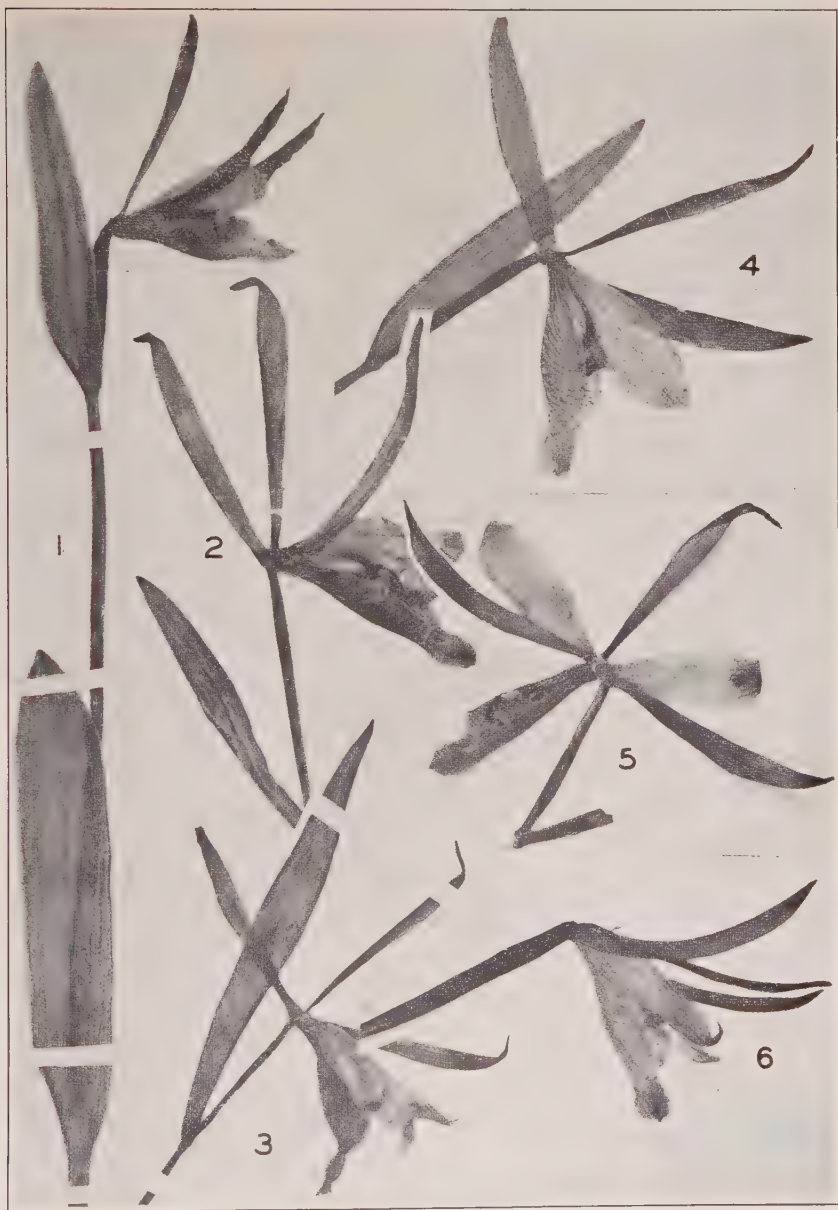


Photo B. G. Schubert

CLEISTES DIVARICATA, var. BIFARIA, all figs. $\times 1$: FIG. 1, upper half of plant from TYPE-series; FIGS. 2-6, flowers from various localities.



MAP 1, Range of typical *CLEISTES DIVARICATA*; MAP 2, of var. *BIFARIA*.

rather strongly defined varieties passing as *Cleistes divaricata*. The plant which is confined to the Coastal Plain, northward to southern New Jersey but in the South not found west of northern Florida, seems to be true *C. divaricata*. This plant (our PLATE 1047) in its best development is usually 4 or 5 dm. high, the whole series ranging from 2.2–7.2 (av. 4.5) dm. high, while the peduncle (between the base of the median leaf and the floral bract) is 0.9–2 (av. 1.5) dm. long. The median leaf ranges from 6.5–15 (av. 10) cm. long; the lateral sepals 4–7 cm. long; petals 3.5–5 (by Catesby shown up to 7) cm. long and 8–14 mm. broad; the ovary and stipe during anthesis 2.5–4.5 (av. 3.25) cm. long.

Throughout much of the Southeast, from Florida to eastern North Carolina, west to Louisiana, chiefly on the Coastal Plain, and inland on the Blue Ridge (up to open summits) to North Carolina and on the Cumberland Plateau and Mountains of Tennessee and Kentucky, the plant is generally smaller in most parts, var. *bifaria* (from its two areas of development). In var. *bifaria* (PLATE 1048) the stem is rarely 6.5 dm. high, usually ranging from 1.5–5 dm., with the peduncle 0.3–1.6 (av. 1) dm. long and the median leaf 3.5–13 (av. 7.6) cm. long. Its flower is conspicuously smaller, though sometimes approaching that of var. *typica*, with longer sepals 3–4.5 cm. long, petals only 2–3

cm. long and 5–10 mm. wide, and ovary and stipe during anthesis 1.2–3.5 (av. 2.6) cm. long.

Occurring on the ancient Cumberland Mountains and Plateau and along the ancient Blue Ridge, var. *bifaria* seems to be the biological type of the species, which, on withdrawal of the Cretaceous and then the Tertiary seas from the country to the east and south, largely moved out to the Coastal Plain. There, in new environment, it has given rise to the larger-flowered extreme (nomenclatural type of the species) which has followed locally northward to southern New Jersey.

As indicating the confusion heretofore of typical *Cleistes divaricata* of the Atlantic Coastal Plain and var. *bifaria* of the southern Atlantic and the Gulf Coastal Plain, as well as the mountains, there is a sheet in the Britton Herbarium, originally in the herbarium of the late Professor Lewis R. Gibbes of the College of Charleston, South Carolina, labeled in the hand of Dr. John K. Small as from "Flat Rock, S. C.". This original label, which, like all original labels, would never be altered or written upon by those who fully respect original documents, was unfortunately altered by a later botanist, who knew the Carolina Mountains, to "N. C." instead of the original S. C., and the original label further desecrated by the misinformative addition "Henderson Co., N. C.". The specimen is of typical Atlantic Coastal Plain *C. divaricata*, which is apparently unknown in Henderson County or elsewhere on the Blue Ridge or on the Cumberland Plateau or Mountains. In view of the fact that Gibbes lived at Charleston and that there is another sheet of material with his original handwriting on the labels (one "Summerville, 20 May, 1859", the other "Flat Rock, 12 June, 1858. L. R. G.") it would seem that the specimen with unjustifiably altered label came from Flat Rock on Flat Rock Creek, which drains into Wateree River, a tributary of Santee River, in Kershaw County, on the Coastal Plain of South Carolina, north of Camden and northwest of Sumter and Charleston.

CALOPOGON PULCHELLUS (Salisb.) R. Br., var. **latifolius** (St. John), stat. nov. Forma *latifolius* St. John in Proc. Bost. Soc. Nat. Hist. xxxvi. 69, pl. 1, fig. 4 (1921). *Limodorum tuberosum*, f. *latifolium* (St. John) House in Bull. N. Y. State Mus. no. 243–244: 51 (1923), as to name only. *Cathea pulchella*, f. *latifolia* (St. John) House, l. c. no. 254: 244 (1924), as to name only.

The original material is much more than a broad-leaved extreme of *Calopogon pulchellus*, a species which, even in the same area, may have the leaf varying from narrowly linear and only 2–4 mm. wide up to lanceolate or lance-oblong and up to 2 cm. wide, while very extreme and gigantic plants (up to 9.75 dm. high), may have the leaf up to 3–5 cm. broad. In this typical *C. pulchellus*, either very narrow- or very broad-leaved, the leaf is usually solitary and much shorter than the elongate scape. The type of var. *latifolius* has the leaves often paired and broadly lance-oblong to narrowly oblong-ovate, only twice to six times as long as broad and greatly overtopping the very short scape, while its heavily dark-coated tuber is much larger (2 cm. thick) than in any typical *C. pulchellus* I have ever seen. The type is past flowering, but other material, also from Sable Island, is flowering. This is narrower-leaved and has either paired or single leaves, although its scape is much shorter than to barely overtopping the leaf or leaves; furthermore, some material from the Magdalen Islands is strongly transitional to var. *latifolius*. This plant of Sable Island and, less typically, of the Magdalen Islands is not the Newfoundland *Limodorum tuberosum*, var. *nanum* Nieuwland in Am. Midl. Nat. iii. 130 (1913). The latter is merely typical *Calopogon pulchellus* at its bleak northern limit, 0.7–2 dm. high, with scape much overtopping the leaf, the raceme reduced to 1–4 flowers, merely the smallest extreme of the species, just as plants of southeastern Virginia 6–9.75 dm. (pretty close to 1 m.) high, with the leaf 3–5 cm. broad and the 10–20 flowers 4–4.5 cm. broad, are the largest. The paired and short leaves and the large tuber of the type of var. *latifolius* give the plant (past flowering), as shown in St. John's figure, the aspect of *Liparis!*

SPIRANTHES TUBEROSA Raf., var. **Grayi** (Ames), comb. nov. *S. Grayi* Ames in RHODORA, vi. 44 (1904). *S. simplex* Gray, Man. ed. 5: 506 (1867), not Griseb. Fl. Brit. W. Ind. 641 (1864).

As noted by me in RHODORA, xlviii. 6 and 10 (1946), the name *Spiranthes tuberosa* Raf., Herb. Raf. 45 (1833) antedates by seven years the name *S. Beckii* Lindley (1840), the latter name currently used for the very slender and tiny-flowered plant which Ames correctly, except for the overlooked *S. tuberosa*, named *S. Grayi* in 1904. It is fortunate, at least, to be able to dismiss the

name *S. Beckii*, for Lindley made a sad mess of his original publication of it in his *Genera and Species of Orchidaceous Plants*, 472 (Sept. 1840). There, in the fashion of many British botanists of his day (and too often of the present day), he chose the British use of the name *S. gracilis*, rather than the earliest use of it. Consequently, he took up *S. gracilis*, as of Hook. (we now would say *sensu* Hook.), Fl. Bor.-Am. ii. 202, t. 203 (1839), with the synonymy copied directly from Hooker. Hooker mis-cited the combination as starting in Bigelow, Fl. Bost. ed. 2: 322 (1824), Bigelow having called it *Neottia gracilis*. Hooker cited his *S. gracilis* (Bigel.) Hook. as having the "HAB. Canada; and Lake Huron (*Dr. Todd*) to Fort Franklin, on the Mackenzie River. *Dr. Richardson. Drummond*" and his plate beautifully showed the Canadian *S. lacera* (Raf.) Raf., l. c. 44 (1833), discussed and illustrated by me in RHODORA, l. c. 5-9, pl. 993 (1946). Lindley, maintaining *S. gracilis sensu* Hooker (1839), assumed that Drummond, who actually explored northward to northern Canada, had collected it much farther south, consequently he interpreted the Drummond citation given by Hooker as meaning "Louisiana", then for good measure he added "etiam in Bahamis"! *S. gracilis* (Bigelow) Beck, Bot. 333 (1833) and *S. gracilis* (Bigelow) [sensu] Hooker (1839), although two different species so far as the plants are concerned, both go back nomenclaturally to the same type.

Having thus temporarily saved the name *Spiranthes gracilis sensu* Hooker (1839), Lindley's next problem was to dispose of the earlier *S. gracilis* (Bigelow) Beck (1833). That was quickly accomplished by renaming the latter *S. Beckii* Lindl. l. c. (1840), with the additional synonyms *Neottia tortilis* [sensu] Elliott (1822) [not Swartz (1800)], and *Limodorum praecox* Walt. (1788) basis of *S. praecox* (Walt.) S. Watson (1890). Nomenclaturally alone the name *S. Beckii* Lindl. is doubly illegitimate. If it was, as he said, the same as the earlier *S. gracilis* (Bigelow) Beck he should have used the latter name for it; if, however, it was also the same as *Limodorum praecox* Walt. (1788) Lindley should have retained this specific name. Taxonomically, furthermore, *S. Beckii* Lindl. was as hopeless a muddle as could be imagined, for it was concocted from elements of several different species. *Limodorum praecox* Walt., originally described with fibrous roots

and ensiform leaves ("radicibus fibrosis, foliis ensiformibus") etc., is a plant with long and mostly linear firm leaves extending up the stem, the relatively coarse spike with heavily pubescent rachis, bracts and ovaries, the perianth 4–6 mm. long, etc., the perianth of *S. tuberosa* being only 2–3 mm. long. Nevertheless, Lindley described his *S. Beckii* as "perfectly glabrous. The flowers are very minute . . . *S. glaberrima*, foliis omnibus radicalibus anguste ovalibus" etc. If, furthermore, it were *N. tortilis* sensu Elliott, it would be very difficult to reconcile Lindley's description with Elliott's "foliis radicalibus linearibus . . . *Stem* pubescent towards the summit. *Leaves* . . . of the root linear lanceolate, nine to ten inches long . . . Bracteal leaves pubescent" etc. In view of the vertical, finger-like, usually solitary tuber of *S. tuberosa* ("*S. Beckii*" of most recent authors) it is illuminating that Lindley knew nothing of this character nor did those authors with whose descriptions he associated his name. Furthermore, since his *S. Beckii* was "perfectly glabrous" as is *S. tuberosa*, it is significant that Lindley said in his Latin diagnosis "ovario puberulo", a character belonging to *S. praecox*. The "lip [with] . . . a remarkably lax cellular texture" applies to *S. tuberosa*, but the description and cited synonyms otherwise are so confused that it is certainly fortunate that the name given by Lindley is illegitimate.¹

Spiranthes tuberosa consists of two strongly marked geo-

¹ Hooker, under his *Spiranthes gracilis* (i. e. *S. lacera*), a plant with glabrous inflorescence, and which Hooker correctly described "foliis radicalibus ovatis petiolatis", cited as synonyms the much earlier *Ophrys aestivalis* Michx. Fl. Bor.-Am. ii. 157 (1803) and *Neottia tortilis* Pursh, Fl. Am. Sept. ii. 589 (1814), "(non Sw.)". Lindley, under *Spiranthes gracilis*, cited the same synonyms. Evidently neither he nor Hooker studied very closely the Michaux description [and specimens] nor the description by Pursh; otherwise they would not have cited them under the wholly glabrous *S. gracilis*, with leaves all basal and ovate, for Michaux definitely described his *Ophrys aestivalis*: "O. scapo folioso: foliis glabris, lanceolatis, acutissimis: spica pubescente, spirali" etc. and he suspected that it might be the *Limodorum praecox* of Walter, *O. aestivalis* occurring "a Pensylvania ad Carolinam". The type of *Ophrys aestivalis*, a species which I do not find accounted for in recent American literature, as shown in one of Cintract's photographs before me, consists of two full plants, with linear-lanceolate leaves extending up the stem, the longer blades about 2 dm. long, the slightly spiraling to secund spike with perianths 6 mm. long. Mounted with these two plants is a broken-off spike of *Spiranthes cernua*, which obviously was an inadvertent addition made by the mounter. *Ophrys aestivalis* Michx. (1803) is *Spiranthes vernalis* Engelm. & Gray (1845). Most fortunately, we do not have to displace the latter name, for there is an Old World *Spiranthes aestivalis* Richard (1818).

As to Pursh's misidentification of *Neottia tortilis*, we need not here go into details, except to note that Pursh included under it *Ophrys aestivalis* Michx., gave the same range as the latter, and described the leaves as linear. Enough said!

graphic variations. Essentially all the material in the Gray Herbarium and that of the New England Botanical Club from New England, forty-five collections, has a relatively close spike with closely spiralling and often crowded and overlapping flowers, as in the type of *S. simplex* Gray, not Grisebach. This plant varies from 0.7–3 dm. (farther south to 4.5 dm.) in height, and its vertical tuber is thick and finger-like, usually solitary. This, as said, is the plant described by Gray as *S. simplex* and correctly renamed by Ames *S. Grayi*. All the material in the Gray Herbarium from the southernmost states, from Florida to eastern Texas, north to South Carolina, has the spike strongly secund, without or with few spiral twists in the rachis and the relatively few flowers distant and not overlapping. From North Carolina to New Jersey both variations, with some transitions, occur, the plant often reaching a height of 5.25 dm., while its roots are usually more slender and not infrequently 2 or even 3. This is true *S. tuberosa* Raf. which was described with "spic. gracilis vix spiralis secunda . . . pedal."

Dr. Schubert has made dissections of flowers from several specimens of each extreme and, while each series shows some variation in the degree of toothings and shape of the lip, there appears to be nothing constant except the relatively dense and strongly spiralling spike and usually thicker tuber to separate var. *Grayi* from the usually more southern typical *S. tuberosa*.

Gray's *Spiranthes simplex*, type of *S. Grayi* and of *S. tuberosa*, var. *Grayi*, had "scape . . . bearing a small narrow (rarely 1-sided) spike of *very short flowers* (perianth 1"—1½" long)". It came from "E. Mass. (Nantucket, Dr. Robbins), New Jersey (C. F. Austin, &c.), and Delaware, Wm. M. Canby." Gray's original sheet contains the Nantucket material from Robbins, which is the dense-spiked *S. tuberosa*, var. *Grayi*; a series of six quite similar plants collected by himself ("&c.") in the pine barrens of New Jersey (the Austin material evidently not retained by him), and three characteristic plants (one of them misplaced by the mounter) with the "rarely 1-sided" spike from Canby, but marked as from "Salisbury, Maryland" (not "Delaware"), this Canby material being of typical *S. tuberosa*.

CORALLORHIZA, NOT CORALLORRHIZA.—From the first edition of Gray's Manual (1848) through the 6th edition (1890) the saprophytic woodland Coral-roots were rightly called *Corallorhiza*, although the genus was ascribed to Haller, whose definition of it was prior to 1753, in his Enum. Meth. Stirp. Helvet. i. 278 (1742), Haller, who went back to Rupprius, then spelling the generic name *Corallorhiza*. In the 7th edition of Gray's Manual (the *Orchidaceae* revised by Professor Oakes Ames) Haller was bracketed as the author prior to 1753, the post-Linnean author given as Robert Brown; and the spelling was changed to *Corallorrhiza*. Although Robert Brown was there and in the later compendium of Ames, his Enum. Orch. U. S. and Can. 21 (1924), made the first post-Linnean author of the genus, Brown himself had cited the genus as starting after 1753 in Haller's Hist. Stirp. Helvet. ii. 159 (1768). That was correct, so far as it went, and Haller in 1768 had adopted the better Greek spelling, *Corallor-rhiza*. Brown gave the common circumboreal species the specific name *C. innata* R. Br. in Ait. Hort. Kew. ed. 2, v. 209 (1813).

In Gray's Manual, ed. 7, and in his Enumeration of 1924 Ames took up for the original species of the genus, the latter said by him to date from 1813, a binomial dating from 53 years prior to Brown's publication, a case of putting prophecy before history which has puzzled many students, for the genus *Corallorhiza* and its species *C. trifida* were both clearly and very adequately published in Chatelain's Specimen inaugurale de Corallorhiza in 1760, the genus clearly diagnosed on p. 6, the species on p. 8. Here, so far as I can find, is the initial date (after 1753) for both CORALLORHIZA and its original species, *C. trifida*, which was based on *Ophrys Corallorhiza* L. (1753). We thus get rid of the situation wherein a binomial seems to have been published 53 years earlier than the genus under which it was placed; but, at the same time, we can return to the long-familiar spelling of the generic name, since, by the International Rules of Nomenclature, the original spelling (in this case of Haller in 1742 as well as of Chatelain in 1760) must stand¹. The correction of the first post-

¹ Since the above was written the similar decision of Rendle and Britten in Journ. Bot. xlv. 442 (1907) has come to my attention: "This genus was established by J. J. Chatelain 'Specimen inaugurale de Corallorhiza' 1760. He names the species *C. TRIFIDA*, which must stand, as the Linnean trivial *Corallorhiza* (under *Ophrys*) is inadmissible".

Linnean author of the genus (but incorrectly as *Corallorrhiza*) was made in Britton & Brown, Ill. Fl. ed. 2, i. 574 (1913) but, singularly enough, in a work seeming to be authoritative, Schlechter's Monographie der Gattungen und Arten in Keller & Schlechter, Monographie und Iconographie der Orchideen Europas und des Mittelmeergebietes, Fedde, Rep. Spec. Nov. Sonderbeihft A, Lief. 9-10, 302, 303 (1928), the anomaly again appears: the genus *Corallorrhiza* here started from Robert Brown in 1813, but its single European species given as "1. *C. trifida* Chatel., Spec. inaug. Corall. (1760), p. 8"!

In current works on the flora of the northeastern United States the lip of *Corallorrhiza trifida* is described as "white, not spotted" (Gray's Man. ed. 7), "lip unspotted" (Wiegand & Eames, Fl. Cayuga Lake Basin), "lip usually pure white" (A. M. Fuller, Studies on the Fl. Wisc. Part I: The Orchids), etc.; though rarely in America it is described, as by Morris & Eames (Our Wild Orchids), as "almost as often spotted as unspotted". Their discussion, however, shows that no distinction was being made between plants of North America and those of northern Eurasia and that they included Canada to the Arctic. In view of the usual lack of red or purple mottling of the lip in the United States and southernmost Canada it is worth noting that Chate-lain, in his original account of European *C. trifida*, said "labellum . . . album, punctis coccineis notatum", while Schlechter, l. c., describing the European plant, says "die Petalen zuweilen rot punktiert, Lippe weiss rot punktiert".

In 1916, Cockerell in Torreya, xvi. 231, getting in Colorado the common plant of the United States, with "lip whitish", described it as *Corallorrhiza coloradensis* n. subsp., he then separating it because the true European plant, as shown by the enlarged figures of flowers published by H. Müller, has the throat "dotted with dark pigment". Almost a century earlier, however, Thomas Nuttall clearly understood the situation when he monographed our species in his *Remarks on the Species of Corallorrhiza, indigenous in the United States* in Journ. Acad. Nat. Sci. Phila. iii. 135-139, with plate (1823). Nuttall there defined his new *C. "verna . . . petalis omnibus lineari-lanceolatis patentibus, labello oblongo immaculato basi bidentato apice recurvo ovato calcare obsoleto innata . . . whole plant except the lip, of a*

yellowish-green colour . . . Lip nearly white, without spots", etc. This species, *C. innata* in the sense of Muhlenberg, Amos Eaton and Nuttall's Genera, was based primarily on material from New England and in his "OBSERVATION" Nuttall wrote: "Mr. Eaton justly remarks the discrepancy of this plant with the species which I had erroneously considered the *Corallorhiza innata* of Europe"; but, pursued by the fatality which so often confuses those who attempt clarification, Nuttall proceeded in his discussion to ascribe to his new eastern American *C. verna* (which he had just correctly defined as "whole plant except the lip, of a yellowish-green colour . . . three outer petals lanceolate-linear spreading; the two inner . . . [of] nearly the same figure and colour. Lip nearly white, without spots, . . . the point ovate") the distinctive characters of European *C. innata*! These were given (with obvious lapse or omission of a phrase) in his observation where he said of his new species: "It differs also from the European . . . principally in the oblong ovate form and whiteness of the inner lateral petals [characters of the *European*], also by the lip which is obtuse and spotted [the spots belonging to the *European*], and in the connivence of the two upper and outer petals with the inner [as shown in detailed figures of the *European*]".

Only by those who see no difference between the Eurasian and the more boreal North American plant, with connivent sepals forming a hood, blunt oblong white petals and round-tipped spotted lip, and the temperate American plant with lanceolate sepals, linear-lanceolate yellow-green petals, lip abruptly tipped and unspotted, Nuttall's confusion of the two in his "OBSERVATION" will be applauded. By those who have carefully compared the two series it will be recognized that in the main the temperate North American plant with "Lip white, unspotted", is well separated from the Eurasian and Hudsonian North American *C. trifida*.

In 1926, reporting on explorations in northern Newfoundland of a party of New England and more southern botanists who were all familiar with the narrow-petalled plant with unspotted lip, I recorded from near the Straits of Belle Isle (a Hudsonian to Subarctic area) a plant which differed from what we had been considering to be true *Corallorhiza trifida*. "The plant which was

troubling us had more purple; . . . the sepals purple or brown; the lip larger and with long rows of purple dots below the marginal notches", etc.—Fernald in RHODORA, xxviii. 93 (1926). This plant was then identified with the original description and beautiful colored plate of the northern European *C. ericetorum* Drejer, a plant which is now generally considered an unimportant (small) phase of true *C. trifida*. Now, with the generous aid of Dr. Schubert in making dissections, it appears that the more northern plants in North America are true *C. trifida*, occurring from southern Greenland to Alaska (thence to northern Eurasia), south in tundra, peat, moss and peaty thickets or woods to northern Newfoundland, the Côte Nord of Quebec, shores of Hudson Bay, northern Ontario, and along the mountains to Wyoming and Oregon.

Meeting the southern limit of true *Corallorhiza trifida* in North America and sometimes overlapping it is the northernmost series of *C. verna* Nutt. Perfectly definite southward, the latter seems northward to show transitions, whether through crossing or otherwise, and its treatment as a relatively southern variety of the more boreal and typical *C. trifida* seems justified. It thus becomes

CORALLORHIZA TRIFIDA Chatelain, var. **verna** (Nutt.), comb. nov. *C. verna* Nutt. in Journ. Acad. Nat. Sci. Phila. iii. 134 (1823). *C. odontorhiza* (Willd.) Nutt., β . *verna* (Nutt.) Wood, Class. Bk. ed. 2: 531 (1847). *C. innata* R. Br., var. *virescens* Farr in Contrib. Bot. Lab. Univ. Pa. ii. 425 (1904). *C. Corallorhiza*, ssp. *coloradensis* Cockerell in Torrey, xvi. 231 (1916). *C. trifida*, var. *virescens* (Farr) Farwell in Papers Mich. Acad. Sci. xvi. pt. 1: 9 (1941).—Details of flower well shown by A. M. Fuller, Bull. Pub. Mus. Milwaukee, xiv. no. 1, pl. 51 (as *C. trifida*) (1933).—Dry to moist woods, sometimes in bogs, Newfoundland to British Columbia, south to Nova Scotia, New England, New Jersey, Pennsylvania, mountains to Georgia and Tennessee, Ohio, northern Indiana, Wisconsin, Missouri, South Dakota, Colorado and Oregon.

Details of flowers of typical *Corallorhiza trifida* are shown in many European works. A few specially accurate illustrations are the following: Reichenb. f., Ic. Fl. Germ. xiii–xiv. pl. 490 (1851); H. Müller, Alpenbl. 77, fig. 21 (1881); Knuth, Handb. Blütenbiol. ii. pt. 2: 456 (1899); Correvon, Album Orchid. pl. 9 (1899); Lindman, Svensk. Fanerogamfl. fig. 125, no. 6 (1918).

The largest-flowered species of *Corallorhiza* in temperate North America, *C. striata* Lindl., has a remarkably disrupted range: the Gaspé Peninsula; southwestern Quebec to western Ontario, south to northwestern New York and southern Ontario, Michigan, northern Wisconsin and northeastern Minnesota; southern Alberta and southern British Columbia, with tongues down the mountains to northwestern Wyoming, eastern Idaho and California; in the East preferring calcareous woodlands and growing chiefly at the bases of *Thuja occidentalis*. Throughout this broad range the plant (scape, sheaths and perianths) is of a warm madder-purple, with the sepals and 2 upper petals conspicuously 3 (or 2)-striate with deep purple. At the easternmost limit of the range the stem, sheaths and perianth are yellow- or orange-brown, comparable with color-forms in *C. maculata* Raf.¹ and *C. odontorhiza* (Willd.) Nutt. This plant may be called

C. STRIATA Lindl., forma **fulva**, forma nov., scapo vaginis perianthiisque fulvis. TYPE: arbor-vitae woods, cold walls of Percé Mt., Percé, Gaspé Co., Quebec, July 25, 1905, *Williams, Collins & Fernald* (Herb. Gray.).

(To be continued)

APPLICATION OF THE NAME EUPHORBIA MACULATA L.

F. R. FOSBERG

SVENSON, in his valuable discussion of the Descriptive Method of Linnaeus (*RHODORA* 47: 273–302, 363–388, 1945), disagrees with Wheeler's interpretation of the Linnaean *Euphorbia maculata*. The latter (*Contr. Gray Herb. n. s.* 127: 76, 1939) applied this name, on the basis of the Linnaean specimen, to the upright species long known as *E. nutans* (or *E. Preslii*), regarding the Plukenet figure cited by Linnaeus as of secondary importance. Svenson, arguing that the latter figure is of equal significance

¹ When, in *RHODORA*, xxiv. 145–148 (1922), Bartlett defined (as varieties) the color-forms of *Corallorhiza maculata* Raf. in *Am. Mo. Mag.* ii. 119 (1817), he considered the yellow plants as relatively rare, while his purplish var. *punicea* is relatively common. He then concluded: "The deeply purple-stemmed var. *punicea* might with some reason be viewed as the biological type of the species, and therefore chosen, in the absence of a type specimen, as the nomenclatorial type as well". Bartlett and those who have followed him, but treating the color-forms as formae, apparently overlooked Rafinesque's statement that in the original *C. maculata* "the whole plant is yellowish".



EUPHORBIA MACULATA: FIG. 1, Plukenet's figure (in part), Alm. t. 65, f. 8; FIG. 2, *E. supina* Raf. from Winchester, Massachusetts, Smith & Zimmerman; FIG. 3, Washington, D. C., Freeman.



FIG. 4, *EUPHORBIA MACULATA*: the specimen in Herb. Linnaeus.

with the specimen in illustrating Linnaeus' concept, used the case of *E. maculata* as an example, attempting to show that if the Plukenet figure is regarded as the type, long-established usage will be preserved and the name will continue to be applied to the prostrate plant referred by Wheeler to *Euphorbia supina* Raf.

To test Svenson's conclusions I examined the specimens of the two species in the herbarium of the U. S. National Arboretum, many of them annotated by Wheeler, and compared them with Svenson's reproduction of Plukenet's figure (*RHODORA* 47: pl. 990, 1945). The results were as follows:

(1.) The upright plant (our FIG. 3) frequently has the reduced axillary shoots, referred to by Svenson, as well developed

as in Plukenet's figure (our FIG. 1). (2.) The leaves of the upright plant practically always have petioles as long as or longer than those of *E. supina* (our FIG. 2). (3.) Most important of all, the length of the leaves in the Plukenet figure is over half that of the internodes, corresponding to the upright plant (FIG. 3) rather than the prostrate one (FIG. 2), which has them less than half. This gives a valuable clue to the scale of the drawing.

The Plukenet figure looks as though it represented an upright plant rather than a prostrate one, though this is inconclusive. Furthermore, in Linnaeus' treatment nothing is said about a prostrate habit, though this character is striking enough so that it probably would have been mentioned.

Moreover, the statement in the Mantissa (2: 392, 1771) "*Euphorbia maculata* similis *E. hypericifoliae*" lends weight to Wheeler's conclusion, as *E. hypericifoliae* L. is superficially almost indistinguishable from *E. maculata* (sensu Wheeler), while it bears no resemblance to the prostrate *E. supina*. Most important of all, the specimen preserved by Linnaeus and in his Herbarium when he prepared *Species Plantarum* (1753) is, as shown by a photograph (our FIG. 4) provided by Professor Fernald, the upright plant which Plukenet had shown, not the prostrate one selected by Svenson.

The addition of the photo. of the modern upright specimen to Svenson's plate removes all force from the similarity of his two illustrations.

My conclusion, therefore, is that both the Plukenet plate and the entire Linnaean treatment apply to the upright plant, which should be called *Euphorbia maculata* L. The confusion surrounding this species did not exist in Linnaeus' concept, but was introduced by later misinterpretations. This example, consequently, does not seem to have much bearing on the problem of the application of Linnaean names to present-day concepts.

Falls Church, Virginia.

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